

The whole rock composition and K-Ar age of volcanic rocks near the Bayshin Tsav in the Southern Mongolian Gobi Desert

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We newly discovered volcanic rocks near the Bayshin Tsav in the Southern Mongolian Gobi Desert. The upper Cretaceous sedimentary strata occurs in the Bayshin Tsav, but the origin and age of the volcanic rocks are unclear. Yarmolyuk et al. (2015) reported the continental rift-related volcanic rocks younger than 130 Ma in the west from the study area. In addition, many Paleozoic volcanic rocks related to the Central Asian Orogenic Belt (CAOB), the world's largest accretionary orogen, are known in Mongolia. In the east from the study area, approximately 270 Ma volcanic rocks related to back-arc formed by the subduction before collision between the South Mongolian microcontinent (SMM) and the North China Craton (NCC) have been reported (Li et al., 2015). In this study, we conducted the whole rock composition analysis and the K-Ar age dating of the volcanic rocks and compared with those of the surrounding volcanic rocks to constrain their origins and intrusion age.

The whole rock compositions of twelve volcanic rock samples was analyzed using the XRF equipment (ZSX Primus II) at Okayama University. Six samples including fresh feldspar were selected, and the K-Ar feldspar age dating was carried out. Potassium was measured by the flame spectroscopy (Nagao et al., 1984). Argon was measured by the isotope dilution method with ^{38}Ar as a spike and the mass spectrometry (Itaya et al., 1991).

Based on major elements of the whole rock composition, the volcanic rocks are classified into alkali series rocks of basalt, basaltic trachyandesite, andesite, trachyandesite, and trachyte/trachydacite, mainly showing andesitic-dacitic compositions. In the Harker diagram, data from each sample was plotted on a straight line, representing one volcanic series. N-MORB normalized trace element spider diagram is characterized by incompatible element-rich pattern which increases from right to left across the diagram and negative Nb anomaly. The $\text{Zr}/\text{Al}_2\text{O}_3\text{-TiO}_2/\text{Al}_2\text{O}_3$ tectonic field discrimination (Condie, 1989) shows that the volcanic rocks in this study were formed by arc-related volcanism, rather than the within plate volcanism. The K-Ar feldspar ages from six volcanic rocks yielded the age range from 270 to 239 Ma, indicating that andesitic and dacitic magmatism occurred during this period. The alkali series compositions, incompatible element-rich pattern and negative Nb anomaly in the spider diagram, the tectonic field discrimination diagram, and K-Ar feldspar ages indicate that the volcanic rocks newly discovered in Bayshin Tsav were formed by back-arc type subduction at ca. 270-240 Ma. This origin is similar to the back-arc volcanic rocks in the subduction zone related to the CAOB, which are distributed near the boundary between SMM and NCC in the east from the study area.

References

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